

of the organic acid [is in a volumetric ratio with] to the fluoride-containing solution [at] is about 10:1 to about 500:1.

REMARKS

The Final Office Action mailed September 8, 2000, has been received and reviewed. Claims 1 through 4 and 6 through 15 are currently pending in the application. Claims 1 through 4 and 6 through 15 stand rejected. Applicants propose to amend claim 1, and respectfully request reconsideration of the application as proposed to be amended herein.

35 U.S.C. § 112 Claim Rejections

Claim 1 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicants propose to amend claim 1 to overcome this rejection and respectfully request reconsideration of this rejection.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 5,300,463 to Cathey

Claims 1 through 4 and 6 through 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cathey (U.S. Patent No. 5,300,463). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

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The Cathey reference discloses a method of utilizing and etching SiO₂ in the processing of semiconductor wafers. The method includes utilizing an acid solution comprising at least two different mineral (inorganic) acids in a selected ratio to one another, one of the inorganic acids being HF. The preferred ratio of the *second inorganic acid* (mineral acid) to HF is between 20:1 and 110:1. The Cathey reference discloses that the solution comprising at least one inorganic (mineral) acid and HF selectively etches a doped SiO₂ layer. The Cathey reference further discloses that acetic acid may be included in the solution. However, the Cathey reference states, “[a]cetic acid is a known prior art component in wet acid etching which provides bath stabilization and extends bath life. Such does not constitute a part of this invention, nor is it necessary in the invention.” (Cathey, col. 2, lines 49-53.)

By way of contrast, independent claim 1, as proposed to be amended, provides, “an etchant solution which selectively etches borophosphosilicate glass over tetraethyl orthosilicate, said etchant solution comprising an organic acid and a fluoride-containing solution provided in a selected ratio relative to one another, wherein the volumetric ratio of the organic acid to the fluoride-containing solution is about 10:1 to about 500:1.”

Applicant respectfully submits that a *prima facie* case of obviousness cannot be established because no suggestion or motivation exists, in the Cathey reference or in the knowledge generally available to one of ordinary skill in the art, to modify the Cathey reference. Further, no reasonable expectation of success exists for any modification of the Cathey reference. Finally, the Cathey reference does not teach or suggest all of the claim limitations of the presently claimed invention.

With respect to independent claim 1, Examiner acknowledges the Cathey reference does not disclose organic acid in a volumetric ratio of 10:1 to 500:1 with the fluoride containing solution. (Office Action, page 3). Applicants respectfully submit that no motivation exists to modify the Cathey reference to incorporate a higher amount of *organic* acid into the solution. The Examiner appears to suggest that it would be obvious to modify the Cathey reference to include a higher concentration of HF. (Office Action, page 3). However, the current invention, as proposed to be amended, increases the amount of *organic acid* in the solution relative to the HF (fluoride containing solution); not the relative amount of HF. There is clearly no motivation in the Cathey reference to increase the amount of acetic acid (organic acid) in the solution. The Cathey reference explicitly

states that the acetic acid is not a part of the invention and as such, one of ordinary skill in the art would not be motivated to increase the amount of acetic acid in the etchant solution. (Cathey, col. 2, lines 49-53.)

In this respect, the Cathey reference clearly teaches away from increasing the amount of acetic acid (organic acid) in the etchant solution. A prior art reference “must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention.” MPEP §2141.02. Further, applicants respectfully submit that Examiner is improperly applying an “obvious to try” rationale in this case. (Office Action, page 3; “variation of the process parameters is obvious and expected.”) The “obvious to try” standard is inappropriate under §103:

In some cases, what would have been ‘obvious to try’ would have been to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful. . . . In other words, what was ‘obvious to try’ was to explore a new technology or general approach that seemed to be a promising field of experimentation, where the prior art gave only general guidance as to the particular form of the claimed invention or how to achieve it.

MPEP § 2145 (citations omitted). In this case, applicants respectfully submit that it would not be obvious to modify the amount of acetic acid in the Cathey reference as the reference teaches that acetic acid is merely a bath stabilizer and not a critical component of the etchant solution. As such, applicants respectfully submit the Cathey reference does not render independent claim 1 of the present invention, as proposed to be amended, obvious.

Similarly, applicants assert that there can be no showing of a reasonable expectation of success to establish a *prima facie* case of obviousness under 35 U.S.C. § 103 based upon the cited reference. The Cathey reference teaches “[a]cetic acid is a known prior art component in wet acid etching which provides bath stabilization and extends bath life. Such does not constitute a part of this invention, nor is it necessary in the invention.” (Cathey, col. 2, lines 49-53.) As such, no evidence exists, in either the Cathey reference or the art, that the modification of the Cathey reference would be successful. Therefore, any rejection of the presently claimed invention based upon the cited prior art cannot establish a *prima facie* case of obviousness under 35 U.S.C. § 103. As such, independent claim 1, and all dependent claims therefrom, are allowable.

Further, the Cathey reference fails to teach or suggest all the elements of the presently claimed invention. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1970). All words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*, 424 F.2d 1382, 165 USPQ 494, 496 (CCPA 1970).

Examiner acknowledges the Cathey reference does not teach a solution wherein an organic acid is in a volumetric ratio with a fluoride-containing solution at about 10:1 to about 500:1. (Office Action, page 3). Instead, the Cathey reference discloses that acetic acid (an organic acid) is not a necessary component of the invention. (Cathey, col. 2, lines 49-53.) As Cathey does not teach or suggest every element of claim 1 as proposed to be amended, Cathey does not anticipate the presently claimed invention. As such, claim 1, is allowable.

Claims 2 through 4 and 6 through 8 are each allowable as depending, either directly or indirectly, from claim 1.

Claim 3 is further allowable because the Cathey reference does not teach a fluoride-containing solution consisting of ammonium fluoride.

Claim 6 is further allowable as the Cathey reference does not teach an etchant comprising acetic acid in a volumetric ratio with hydrofluoric acid at about 10:1 to about 100:1.

Claim 8 is further allowable because the Cathey reference does not teach or suggest an etchant solution exhibiting a selectivity ratio of borophosphosilicate glass to tetraethyl orthosilicate between about 27:1 and 55:1. Instead, the solution disclosed in the Cathey reference exhibits a selectivity ratio of only 6.3:1. (Cathey, col. 2, lines 58-59).

Independent claim 9 of the presently claimed invention provides, "an etchant solution which selectively etches borophosphosilicate glass over tetraethyl orthosilicate, said etchant solution comprising an organic acid and a fluoride-containing solution, wherein the etchant solution exhibits a selectivity ratio of borophosphosilicate glass to tetraethyl orthosilicate between about 27:1 and 55:1." Applicants submit the Cathey reference does not teach every limitation of independent claim 9.

With respect to independent claim 9, examiner acknowledges the Cathey reference does not disclose a BPSG to TEOS selectivity ratio in the range of 27:1 to 55:1. (Office Action, page 3).

Applicant respectfully disagrees with Examiner's conclusion that the etchant solution in Cathey would exhibit a similar selectivity ratio to the etchant solution of the presently claimed invention. (Office Action, page 3). The Cathey reference discloses an etchant solution comprising 840 ml H_2SO_4 , 960 ml H_2O , 30 ml HF and 60 ml acetic acid. (Cathey, col. 2, lines 43-45). This solution has a BPSG to TEOS selectivity ratio of only 6.3:1; not 27:1 to 55:1. (Cathey, col. 2, lines 58-59). Clearly, the solution of the Cathey reference does not possess a similar selectivity ratio as the etchant solution of the presently claimed invention. As stated above, no motivation exists to increase the amount of acetic acid in the Cathey solution. Applicants incorporate the arguments with respect to this position from above.

As Cathey does not teach every limitation of independent claim 9 of the presently claimed invention, applicants respectfully submit that independent claim 9 is not rendered obvious the Cathey reference. As such, independent claim 9 is allowable.

Claims 10 through 15 are each allowable as depending from independent claim 9.

Claim 11 is further allowable as the Cathey reference does not teach or suggest the fluoride-containing solution is selected from the group consisting of hydrofluoric acid and ammonium fluoride.

Claim 13 is further allowable as the Cathey reference does not teach or suggest the acetic acid is in a volumetric ratio with the hydrofluoric acid at about 1:1 to about 500:1.

Claim 14 is further allowable as the Cathey reference does not teach or suggest the acetic acid is in a volumetric ratio with the hydrofluoric acid at about 10:1 to about 100:1.

Claim 15 is further allowable as the Cathey reference does not teach or suggest the organic acid comprises glacial acetic acid and the fluoride-containing solution comprises 40% ammonium fluoride by weight in water

ENTRY OF AMENDMENTS

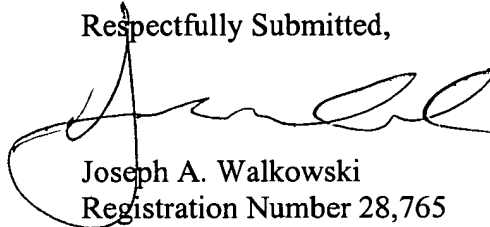
The proposed amendment to claim 1 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application. Further, the amendments do not raise new issues or require a further search.

Finally, if the Examiner determines that the amendments do not place the application in condition for allowance, entry is respectfully requested upon filing of a Notice of Appeal herein.

CONCLUSION

Claims 1 through 4 and 6 through 15 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, she is respectfully invited to contact Applicants' undersigned attorney.

Respectfully Submitted,



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